



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/683,759	10/09/2003	Andrew Ott	42P17277	5056

7590 12/28/2004

Michael A. Bernadicou
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Seventh Floor
12400 Wilshire Boulevard
Los Angeles, CA 90025

EXAMINER

GOUDREAU, GEORGE A

ART UNIT	PAPER NUMBER
----------	--------------

1763

DATE MAILED: 12/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/683,759

Applicant(s)

OTT ET AL.

Examiner

George A. Goudreau

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 October 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23, 25 and 26 is/are rejected.
- 7) ☒ Claim(s) 24 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

George A. Goudreau
GEORGE GOUDREAU
PRIMARY EXAMINER

12-24-04

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Art Unit: 1763

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-2, 4, 14, 17, and 20-23 are rejected under 35 U.S.C. 102(e) as being anticipated by Leu et. al. (6,605,549).

Leu et. al. disclose a process for fabricating a Cu dual damascene structure on the surface of a wafer which is comprised of the following steps:

-A dielectric layer (i.e.-low K, high K, SiC, etc.) (55) is formed onto the surface of a wafer (40).;

-A metallization layer (47) is formed into the surface of the dielectric layer (55).;

-A carbon doped SiO₂ layer (CDO) (42) is formed onto the surface of the dielectric layer (55), and the surface of the metallization layer (47).;

-A via (48), and trench (49) are etched into the surface of the CDO ILD layer (42).;

-The exposed surface of the CDO ILD layer is treated with a plasma which is comprised of H₂ to convert the methyl groups in the CDO layer at the surface of the ILD to polar silanol (i.e.-Si-OH groups) (30).;

-A barrier layer (45) which is comprised of any of TiN, Ta, Ti, TiN, WN, WTa, and TaSiN is conformably formed onto the surface of the CDO ILD layer.; and

-A Cu layer (52) is used to planarize the surface of the ILD layer (42).

This is discussed specifically in columns 5-9; and discussed in general in columns 1-12. This is shown specifically in figures 3-4; and shown in general in figures 1-4.

3. Claims 1-5, 14, 17, 20-23, and 25 are rejected under 35 U.S.C. 102(e) as being anticipated by Pan et. al. (6,821,905).

Pan et. al. disclose a process for fabricating a Cu dual damascene structure on the surface of a wafer which is comprised of the following steps:

- A ILD dielectric layer (11A) is formed onto the surface of a wafer.;
- The surface of the ILD layer is treated with a H₂ based plasma.;
- A Si₃N₄ or SiC etch stop layer (11B) is formed onto the surface of the ILD layer (11A).;
- A IMD layer (12) which may be comprised of CDO, etc. is formed onto the surface of the etch stop layer (11B).;
- The surface of the IMD layer is treated with a H₂ based plasma.;
- A SiC or Si₃N₄ BARC layer (14) is formed onto the surface of the IMD layer (12).;
- A patterned photo resist layer (16) is used in the etching of the BARC layer/ IMD layer/ etch stop layer during the formation of a via opening.;
- A trench opening (22) is then formed in the BARC layer/ IMD layer.;
- The photo resist layer (16) is removed from the surface of the wafer.;

Art Unit: 1763

-A barrier/ diffusion layer is conformably formed onto the surface of the wafer.;

and

-A Cu layer (22) is used to planarize the surface of the wafer, and form a Cu dual damascene structure.

This is discussed specifically in columns 4-7; and discussed in general in columns 1-10. This is shown in figures 1-3.

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 5-13, 15-16, and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leu et. al. as applied in paragraph 2 above.

Leu et. al. as applied in paragraph 2 above fail to disclose the following aspects of applicant's claimed invention:

- the specific usage of the type of plasma treatment apparatus which is claimed by the applicant for conducting the H₂ plasma treatment step which is taught above; and

- the specific process parameters, which are claimed by the applicant for the hydrogen plasma treatment in the process, taught above

It would have been obvious to one skilled in the art to employ any of a variety of different types of plasma treatment apparatus including those which are specifically claimed by the applicant to conduct the H₂ plasma treatment step in the process taught above based upon the following. The usage of the type of plasma treatment apparatus which is claimed by the applicant to process semiconductor wafers is conventional or at least well known in the semiconductor processing arts. (The examiner takes official notice in this regard.) Further, this simply represents the usage of an alternative, and at least equivalent means for conducting the H₂ plasma treatment step in the process taught above to the specific usage of other such means for doing so.

It would have been prima facie obvious to one skilled in the art to employ any of a variety of different plasma processing conditions in the H₂ plasma treatment step taught above based upon the following. These are all well-known variables in the

Art Unit: 1763

plasma treatment art, which are known to effect both the rate and the quality of the plasma treatment. Further, the selection of particular values for these variables would not necessitate any undo experimentation, which would have been indicative of unexpected results.

7. Claims 6-13, 15-16, 18-19, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pan et. al. as applied in paragraph 3 above.

Pan et. al. as applied in paragraph 3 above fail to disclose the following aspects of applicant's claimed invention:

- the specific process parameters, which are claimed by the applicant for the hydrogen plasma treatment in the process, taught above

It would have been prima facie obvious to one skilled in the art to employ any of a variety of different plasma processing conditions in the H₂ plasma treatment step taught above based upon the following. These are all well-known variables in the plasma treatment art, which are known to effect both the rate and the quality of the plasma treatment. Further, the selection of particular values for these variables would not necessitate any undo experimentation, which would have been indicative of unexpected results.

8. Claim 24 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Art Unit: 1763

10. Any inquiry concerning this communication should be directed to examiner

George A. Goudreau at telephone number (571)-272-1434.


George A. Goudreau
Primary Examiner
Art Unit 1763